

CLAIMS

What is claimed is:

1. An apparatus for generating a high energy X-ray beam with spectra used for discriminating materials within a cargo container, the apparatus comprising:

5 an injector modulator adapted to produce a first voltage pulse with a first amplitude and a second voltage pulse with a second amplitude;

an injector adapted to generate an electron beam having an injection current amplitude from said first voltage pulse or said second voltage pulse;

10 at least two master generators adapted to produce a first stream of pulses of RF waves with a first frequency and a second stream of pulses of RF waves with a second frequency;

a commutator adapted to designate said first stream of pulses of RF waves or said second stream of pulses of RF waves as a designated stream of pulses of RF waves;

15 an exciter adapted to multiply frequency of said designated stream of pulses of RF waves and to amplify said designated stream of pulses of RF waves;

an amplifier adapted to amplify said designated pulses of RF waves;

an accelerating section adapted to generate and accelerate an electron beam pulse from said electron beam and said designated pulses of RF waves;

20 an amplifier modulator adapted to control said amplifier on when to provide said designated pulses of RF waves to said accelerating section;

a conversion target adapted to convert said accelerated electron beam pulse to a high energy X-ray beam with spectra; and

25 a synchronizer adapted to control said injector modulator and amplifier modulator to ensure that said accelerating section receives said first stream of pulses of RF waves as said designated stream of pulses of RF waves and said electron beam generated from said first voltage pulse or said second stream of pulses of RF waves as said designated stream of pulses of RF waves and said electron beam generated from said second voltage pulse.

30 2. A method for generating a high energy X-ray beam with spectra used in discriminating materials in a cargo container, the method comprising the steps of:

(a) generating a first voltage pulse with a first amplitude and a second voltage pulse with a second amplitude;

(b) generating an electron beam having an injection current amplitude from said first voltage pulse or said second voltage pulse;

(c) generating a first stream of pulses of RF waves having a first frequency and a second stream of pulses of RF waves having a second frequency;

5 (d) designating said first stream of pulses of RF waves or said second stream of pulses of RF waves as a designated stream of pulses of RF waves;

(e) multiplying frequency of said designated stream of pulses of RF waves;

(f) amplifying said designated stream of pulses of RF waves;

10 (g) generating an electron current pulse from said electron beam and said designated stream of pulses of RF waves;

(h) generating a high energy X-ray beam with spectra from said electron current pulse;

(i) alternating the use of said first voltage pulse and said second voltage pulse to generate said electron beam; and

15 (j) alternating the use of said first stream of pulses of RF waves and said second stream of pulses of RF waves as said designated stream of pulses of RF waves.